Clarke®

PLASMA CUTTER

MODEL NO: 20CI

PART NO: 6016020

OPERATION & MAINTENANCE INSTRUCTIONS

CE

LS0109

INTRODUCTION

Thank you for purchasing this CLARKE Plasma Cutter.

Before attempting to use this product, please read this manual thoroughly and follow the instructions carefully. In doing so you will ensure the safety of yourself and that of others around you, and you can look forward to your purchase giving you long and satisfactory service.

GUARANTEE

This product is guaranteed against faulty manufacture for a period of 12 months from the date of purchase. Please keep your receipt which will be required as proof of purchase.

This guarantee is invalid if the product is found to have been abused or tampered with in any way, or not used for the purpose for which it was intended.

Faulty goods should be returned to their place of purchase, no product can be returned to us without prior permission.

This guarantee does not effect your statutory rights.

PARTS AND SERVICING

For Parts & Servicing, please contact your nearest dealer, or CLARKE International, on one of the following numbers.

PARTS & SERVICE TEL: 020 8988 7400
PARTS & SERVICE FAX: 020 8558 3622
or e-mail as follows:
PARTS: Parts@clarkeinternational.com
SERVICE: Service@clarkeinternational.com

TABLE OF CONTENTS

INTRODUCTION 3
GUARANTEE 3
PARTS AND SERVICING 3
TABLE OF CONTENTS 4
SAFETY RULES AND GENERAL WARNINGS 5
EMC 7
SAFETY DEVICES 7
SAFETY EQUIPMENT 8
SYMBOLS 9
ELECTRICAL CONNECTIONS 10
PRINCIPLES OF OPERATION 11
PARTS IDENTIFICATION 12
ASSEMBLY 13
USING THE PLASMA CUTTER 13
POTENTIAL PROBLEM DURING USE 17
MAINTENANCE 18
TROUBLE SHOOTING 20
SPECIFICATIONS 21
EXPLODED DIAGRAM & PARTS LISTS 22
TORCH EXPLODED DIAGRAM & PARTS LIST 23
WIRING DIAGRAM 24
DECLARATION OF CONFORMITY 25
NOTES 26
NOTES 27

SAFETY RULES AND GENERAL WARNINGS

INTRODUCTION

Your plasma cutting unit is fitted with sophisticated safeguards which block functioning and therefore the cutting operations until all the safety conditions are present. The plasma cutting technique requires dangerously high voltage for pilot arc starting and during cutting, therefore the following safety rules must be observed with great care.

ELECTRICITY

1. Make sure that the unit is earthed and that the supply line has an adequate earth connection.
2. Make sure that the work bench has a satisfactory earth connection.
3. Avoid contact between the metal bars being cut and bare skin or damp clothes.
4. Do not lean on the piece being cut or hold it in your hands.
5. Do not use in damp environments or on wet surfaces.
6. Do not use the unit if the torch or cables appear damaged.
7. Always turn the unit off before replacing the electrode, the nozzle or the spreader tip of the torch.
8. Always switch the unit off and remove the power cable from the mains socket before carrying out any maintenance on the unit.

CAUTION: IF DURING THE CUTTING OPERATION A SLIGHT ELECTRIC SHOCK IS FELT, STOP WORK IMMEDIATELY AND DO NOT USE THE UNIT UNTIL THE FAULT HAS BEEN DISCOVERED AND RESOLVED.

CUTTING FUMES AND GASES

Harmful fumes and metallic powders are produced during the cutting operation. Metals which are painted or coated or which contain mercury, cadmium, zinc, lead and graphite may produce harmful concentrations of toxic fumes during cutting.

To protect the operator or other persons from exposure to possible toxic fumes, fume respirators should be worn and work areas should be adequately ventilated.

When working in enclosed environments, suction units should be fitted below the cutting areas.

CAUTION: WHEN HALOGENATED SOLVENTS OR DEGREASING AGENTS ARE PRESENT, THE MATERIAL TO BE CUT SHOULD BE CLEANED PROPERLY TO PREVENT THE FORMATION OF TOXIC GASES. SOME CHLORINATED SOLVENTS MAY DECOMPOSE IN THE PRESENCE OF THE RADIATION GIVEN OUT BY THE ARC AND MAY GENERATE PHOSGENE GAS.

FIRE HAZARDS

1. Prevent sparks or hot scale from producing flames.
2. Remove inflammable or combustible materials from the cutting area.
3. Make sure that fire-fighting equipment is located near the work area.
4. Situate the unit in an area where the air can be sucked in and exhausted from the grilles on the panel.

CAUTION: DO NOT CUT FUEL OR LUBRICANT CONTAINERS EVEN IF THESE ARE EMPTY. DO NOT CUT CONTAINERS OR CASINGS WHICH CONTAIN INFLAMMABLE MATERIAL.NEVER CUT IN ENVIRONMENTS WHICH ARE POLLUTED BY INFLAMMABLE GAS OR COMBUSTIBLE LIQUID VAPOURS (SUCH AS PETROL).

EMC

Before installing the plasma cutting unit, carry out an inspection of the surrounding area, observing the following guidelines:

1. Make sure that there are no other power supply cables, control lines, telephone leads or other equipment near the unit.
2. Make sure that there are no radio receivers or television appliances.
3. Make sure there are no computers or other control systems.
4. Make sure that there is no-one with a pacemaker or hearing aid in the area around the unit.
5. Check the immunity of any other equipment operating in the same environment. In certain cases additional protective measures may be required.

Interference can be reduced in the following ways:

1. If there is interference in the power supply line, an E.M.C. filter should be inserted between the mains and the unit.
2. The output cables of the unit should be shortened; these should be kept close together and stretched along the ground.
3. All the panels of the unit should be correctly closed after carrying out maintenance.

SAFETY DEVICES

The plasma cutting units are supplied with the following safety devices:

THERMAL PROTECTION DEVICES

These are installed at the points most subject to high temperatures such as the power transformers and the rectifying units. An amber light on the front panel lights up when the thermal protection device intervenes.

AN ELECTRIC SHOCK PROTECTION DEVICE

This prevents the operator from coming into contact with the live parts of the torch (such as the electrode, etc.) This consists of a safety device, built into the body of the torch, which breaks the main power circuit when the end part of the torch is removed to replace the electrode or the tip.

When the electrical protection device intervenes, the unit is prevented from operating.

SAFETY EQUIPMENT

EYE AND BODY PROTECTION

One of the hazards during the welding/cutting process is the emission of electromagnetic waves due to the electric arc. The length of these waves ranges from infrared to ultraviolet. If these rays hit the eyes, they can cause various complaints such as conjunctivitis, burns to the retina, deterioration of sight, etc. Moreover a high concentration of ultraviolet rays can burn the skin. It is, therefore, extremely important that the operator uses adequate safety equipment and clothing, such as:

- Leather gloves
- Leather aprons
- Safety shoes
- Safety mask (or even better helmet) large enough to cover the whole of the face, equipped with safety lenses able to filter all the radiation and reduce the intensity of the light absorbed by the eye.

CAUTION: NEVER, UNDER ANY CIRCUMSTANCES, LOOK AT AN ELECTRIC ARC WITHOUT EYE PROTECTION.

CAUTION: A FURTHER HAZARD FOR EYES IS THE RISK OF SPLINTERS OR PARTICLES WHICH MAY BE DETACHED DURING THE CUTTING OPERATIONS OR DURING GRINDING, BRUSHING OR HAMMERING AWAY OF THE SCALE.ALWAYS WEAR GOGGLES OR PROTECTIVE SHIELDS WITH TRANSPARENT LENSES DURING THESE OPERATIONS TO PREVENT SPLINTERS OR OTHER FOREIGN BODIES FROM ENTERING THE EYE.

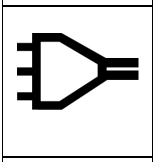
IMPORTANT: safety screens should be installed around the welding area to protect other people, who may be working in adjacent areas, from the radiation given out by the arc.

SYMBOLS

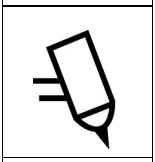
The following symbols appear on your Plasma Cutter:

Caution

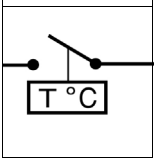
Read the Instruction Manual



Mains Supply



Plasma Cutting



Thermal Protection Device

ELECTRICAL CONNECTIONS

Connect the mains lead to a 230 Volt (50Hz) single phase 30 amp electrical supply, through a suitably fused isolator.

WARNING: DO NOT CONNECT TO A DOMESTIC SYSTEM VIA A 13 AMP PLUG.

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in the mains lead are coloured in accordance with the following code:

Green & Yellow	-	Earth
Blue	-	Neutral
Brown	-	Live

- Connect GREEN & YELLOW cord to terminal marked with a letter "E" or Earth symbol " ⏚ " or coloured GREEN or GREEN & YELLOW.
- Connect BROWN cord to terminal marked with a letter "L" or coloured RED.
- Connect BLUE cord to terminal marked with a letter "N" or coloured BLACK.

We recommend that this machine is connected to the mains supply via a Residual Current Device (RCD)

If in any doubt, DO NOT attempt any connections or repairs yourself. Consult a qualified electrician, your local Clarke dealer or Clarke International on:

020 8988 7400 or e-mail Service@clarkeinternational.com

CABLE EXTENSION

Always use an approved extension cable suitable for the power rating of this tool (see specifications), the conductor size should also be at least the same size as that on the machine, or larger. When using cable reel, always unwind the cable completely.

IMPORTANT		
If a cable extension is needed, it is essential to comply with the following data.		
Voltage	Extension length	Cable section
230V	up to 20 Meters	2.5mm^2
230V	20 - 50 Meters	4mm^2

PRINCIPLES OF OPERATION

WHAT IS PLASMA CUTTING

Plasma Cutting is a fast, clean and distortion free, means of cutting through all types of metal from mild and stainless steels to aluminium and copper.

- An inert gas (compressed air) is blown at high speed out of the nozzle; whilst at the same time an electrical arc travels through the gas heating it to an extremely high temperature, this ionizes the gas.
- The column of heated ionized gas is called "Plasma" and is a good conductor of electricity.
- The cutting procedure utilises the plasma to transfer the electric arc to the metal workpiece, which is melted by the heat and then blown out of the way using the compressed air supply.

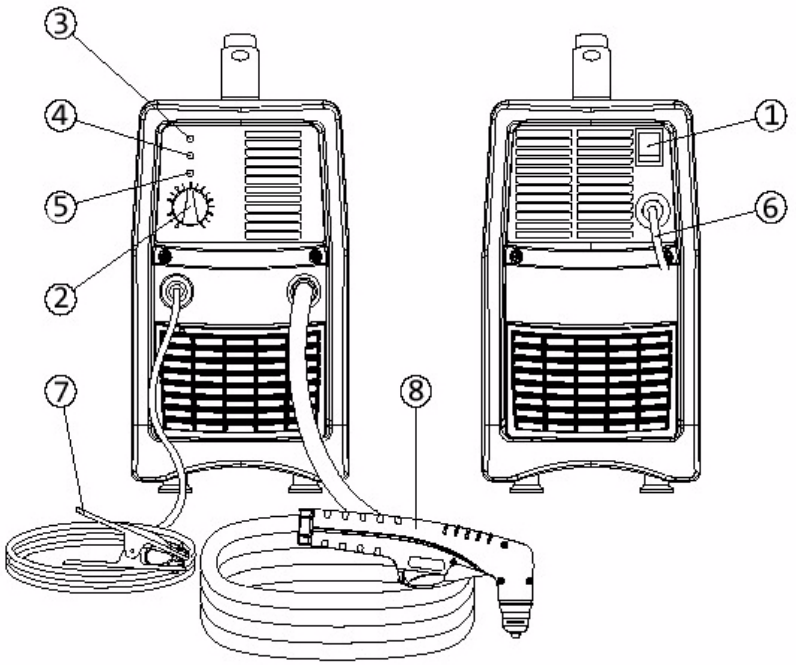
HOW THE PLASMA CUTTER WORKS

- The start of the cycle is determined by an arc, called the pilot arc, which is struck between the electrode (negative polarity) and the torch nozzle (positive polarity) due to the short circuit between these two elements.

NOTE: The duration of the pilot arc is set in the factory at 3 seconds; if the transfer has not been made within this time, the cycle is automatically stops.

- When the torch is brought into direct contact with the workpiece (connected to the positive polarity of the power source) the pilot arc is transferred between the electrode and the workpiece itself thus striking a plasma arc, also called cutting arc.

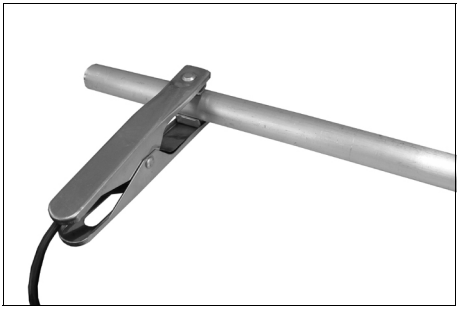
PARTS IDENTIFICATION



1	ON/OFF Switch	
2	Output current knob	Adjusts the cutting current supplied by the machine according to the thickness of material/speed.
3	Green LED	Turns ON when input voltage is applied blinks slowly when voltage goes above 260V, or below 180V.
4	Amber LED	ON when the thermal protection is activated.
5	Red LED	Turns ON when torch is triggered. Blinks quickly during 3 second safety pre-flow prior to pilot arc ignition. Blinks slowly if cutting arcs not initiated after 3 second pilot arc ignition.
6	Input cord	
7	Work cable with clamp	
8	Torch (with a trigger security cap)	

ASSEMBLY

1. Connect the power supply cable to a mains socket.
2. Fasten the earth clamp to the workpiece. If a metal bench is being used, make sure it has also been connected to earth.
    - If the surface of the piece to be cut is painted, rusty or covered with insulating material, clean the surface so that satisfactory contact between the workpiece and the earth clamp can be obtained.



GAS SUPPLY,

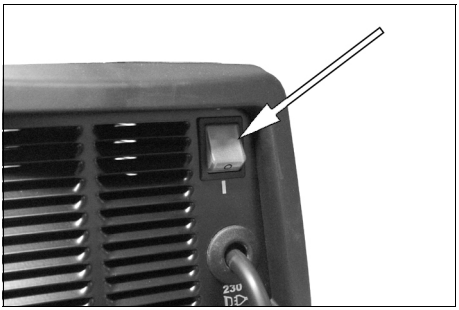
- This unit has a built in compressor which supplys the compressed air to the plasma cutter, a seperate supply is not required.

USING THE PLASMA CUTTER

- The torch can be comfortably held in one hand or steadied with two hands. Choose the technique that feels most comfortable and allows good control and movement. Position the index finger or thumb to press the control switch on the torch handle.

SWITCHING ON/OFF

1. Switch the plasma cutter ON using the ON/OFF switch.
    - The Green LED will light up on the control panel.



CUTTING

1. With the torch in starting position, activate the torch trigger button.
   - The unit will initiate gas purge (pre-flow) to remove any condensation that has accumulated in the torch
   - When the gas purge is complete, pilot arc will come on and stay on until the main cutting arc starts.
   - If cutting arc has not started after 2-3 seconds. The pilot arc will go out. The trigger should be released and pressed again to relight the pilot arc.

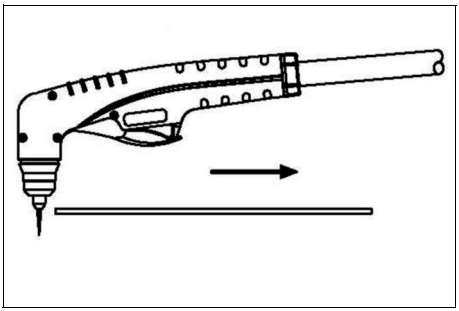
CAUTION: AVOID UNNECESSARY LIGHTING OF THE PILOT ARC, TO PREVENT EXCESSIVE CONSUMPTION OF THE ELECTRODE AND NOZZLE.

CAUTION: BECAUSE THIS MODEL HAS A PILOT ARC, CUTTING CAN COMMENCE EVEN ON METAL WHICH IS PAINTED OR COATED. HOWEVER, DO BE AWARE THAT FUMES MAY BE GIVEN OFF BY BURNING PAINT OR COATED SURFACES.

2. Once on, the main cutting arc remains on as long as the trigger is held down, unless the torch is withdrawn from the work or torch motion is too slow. Keep moving while cutting.

FOR EDGE STARTS

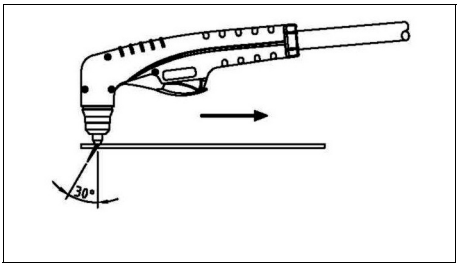
Hold the torch perpendicular to the workpiece with the front of the tip on the edge of the workpiece at the point where the cut is to start.



FOR DRAG CUTS

Keep the torch in contact with the workpiece. For standoff cutting hold the torch 2-3 mm from the work.

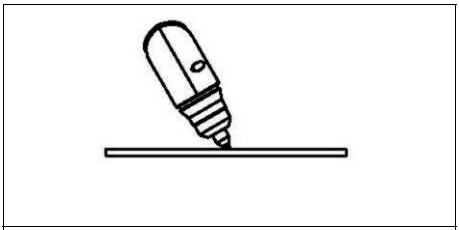
3. Cut at a steady speed without pausing. Maintain the cutting speed so that the arc lag is about 30° behind the travel direction.
4. If the cutting arc is interrupted, and the torch trigger remains pressed, the pilot arc comes back on automatically for 3 seconds.



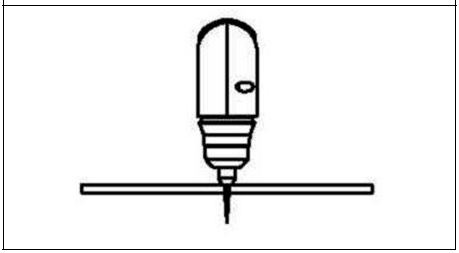
PIERCING WITH A HAND TORCH

NOTE: Recommended maximum piercing capacity is 2mm. If you need to make a cut on a metal sheet which has a sickness of more than 2mm without an edge start, make a hole ø 6mm using an electric drill before you start cutting.

1. When piercing, tilt the torch slightly so that blowback particles blow away from the operator and torch.



2. Complete the piercing off the cutting line and then continue the cut onto the line. Hold the torch perpendicular to the workpiece after the cut is complete.



3. Clean spatter and scale from the shield cup and the tip as soon as possible. Spraying or dipping the shield cup in anti-spatter compound will minimize the amount of scale which adheres to it

CAUTION: SPARKS FROM THE CUTTING PROCESS CAN CAUSE DAMAGE TO COATED, PAINTED, AND OTHER SURFACES SUCH AS GLASS, PLASTIC AND METAL

NOTE: Handle torch leads with care and protect them from damage.

SHUTTING OFF THE PLASMA CUTTER

- To stop cutting remove the torch from the workpiece. To extinguish the pilot arc release the trigger.

NOTE: When the trigger is released, compressed air will continue to flow for a short period of time, in order to cool the torch. Do not switch off the machine until the air has stopped flowing or damage may occur to the torch.

WARNING: WHEN YOU LIFT THE TORCH AWAY FROM THE WORKPIECE THE CUTTING ARC WILL BE LOST BUT THE PILOT ARC WILL REMAIN IGNITED IN THE NOZZLE UNTIL THE TORCH TRIGGER IS RELEASED.

WARNING: NEVER TOUCH THE NOZZLE WHILST THE PILOT ARC IS IGNITED AS THIS MAY RESULT IN SERIOUS INJURY.

AFTER USE

- Allow the plasma cutter time to cool down before storage .
- Drain the air filter before putting your plasma cutter away, See page 19.

POTENTIAL PROBLEM DURING USE

Insufficient penetration	1. Cutting speed too high. 2. Torch is tilted. 3. Workpiece is too thick. 4. Cutting current is too low. 5. Torch parts are worn out.
Interuption of the cutting arc	1. Cutting speed too slow; 2. Excessive distance between torch and workpiece; 3. AC line too low - reduce output current; 4. Torch parts are worn out; 5. Non-genuine Manufacturer's parts; 6. Work cable is disconnected;
Excessive scoria settlement	1. Too low cutting speed (bottom dross); 2. Too high cutting speed (top dross); 3. Excessive distance between torch and workpiece; 4. Cutting current too low; 5. Torch parts are worn out; 6. Non-genuine Manufacturer's parts;
Tilted cutting	1. Torch position not correct; 2. Asymmetric wear of nozzle hole and/or wrong assemblage of the torch parts;
Excessive wear of the nozzle and electrodes	1. Air pressure too low; 2. Exceeding system capability (material too thick); 3. Contaminated air (humidity-oil); 4. Excessive pilot arc arc ignitions in the air; 5. Improperly assembled torch; 6. torch tip contacting workpiece; 7. damaged or loose torch head components; 8. non-genuine Manufacturer's parts.

MAINTENANCE

CAUTION: BEFORE PERFORMING ANY MAINTAINANCE ON THE PLASMA CUTTER LET IT COOL.

CAUTION: REPAIRS, MAINTENANCE OF THE UNIT SHOULD BE CARRIED OUT BY TRAINED PERSONNEL WHO ARE AWARE OF THE RISKS CAUSED BY THE HIGH VOLTAGES

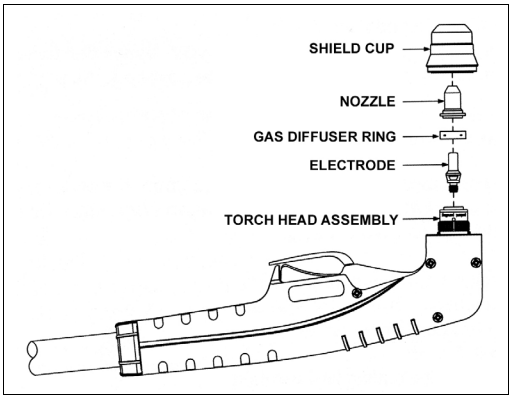
UNIT

- Keep the area around the machine clean and free of combustible materials.
- Do not allow debris to collect, this could obstruct air flow to the machine.
- Inspect the unit every 3-4 months (depending on how often the unit is used) and use compressed air to remove any dust deposits.

TORCH

To replace the consumables in the torch:

1. Unscrew the shield cup from the torch head assembly.
   - Clean the sheild cup thoroughly and replace if it is damaged (burns, distortions or cracks).
2. Remove the nozzle, gas diffuser ring and electrode.
   - Always replace the nozzle, gas diffuser ring and electrode at the same time



3. Fit a new nozzle, gas diffuser ring and electrode, Replace the shield cup and ensure that it is secure.

IMPORTANT: Make sure that you do not cross tread the sheild cup when you reassemble the torch.

TORCH BODY, HANDLE AND CABLE

These parts need no particular maintenance with the exception of a periodic inspection and cleaning.

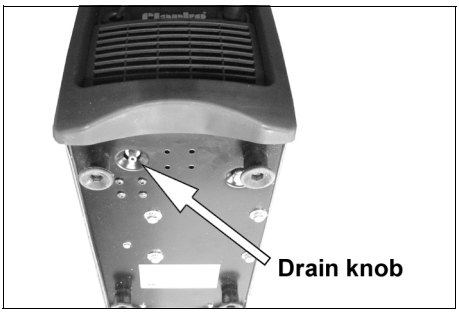
To keep the torch and the cable in good working order it is necessary to follow these precautions:

- DO NOT use solvents or strong detergents when claining the plasma cutter.
- If there is damage to the insulation such as breaks, cracks and burns or even a loosening of electric conductors, the torch must not be used.
- DO NOT touch torch and cable with warm or hot parts.
- DO NOT strain the cable.
- DO NOT move the cable on sharp edges or abrasive surfaces.
- DO NOT step on the cable.
- All repairs must be carried out buy a qualifided service engineer.

DRAINING CONDESATION FROM THE INTERNAL AIR FILTER

The unit is equipped with an internal air filter which must be drained at the end of the day after use.
The filter is fitted with a knob which allows you to drain any condensation that accumulates.

1. Turn the drain knob located on the bottom of the plasma cutter to drain any condensate from the internal air filter.
2. Close the drain knob before use.



REPLACING THE AIR FILTER

- The air filter and air filter cartridge can only be replaced by a qualified service engineer, contact your nearest Clarke service department See page 3.

TROUBLE SHOOTING

GREEN LED OFF,	1. Plug unit into 230V outlet. 2. Reset Breaker.
GREEN LED ON, YELLOW LED ON. Unit is overheating.	1. Make sure the unit has not been operated beyond duty cycle limits. 2. Air Flow obstructed.
GREEN LED ON, YELLOW LED OFF, No air flow when torch switch pressed.	1. Shield cup not properly installed on torch. Check that shield cup is fully seated against torch. 2. Faulty Torch Switch 3. Faulty Main PC Board Repair / Replace Power Supply.
GREEN LED ON YELLOW LED OFF Air flows, Pilot arc does not start.	1. Faulty torch parts. Inspect torch parts and replace if necessary. 2. Faulty main PC Board. Repair / replace.
Torch has pilot arc but does not cut.	1. Work lead not connected. Make sure work lead is connected securely to bare metal. 2. AC input power too low. Use shortest distance to breaker panel possible. 3. Faulty Main PC Board. Repair/ Replace.

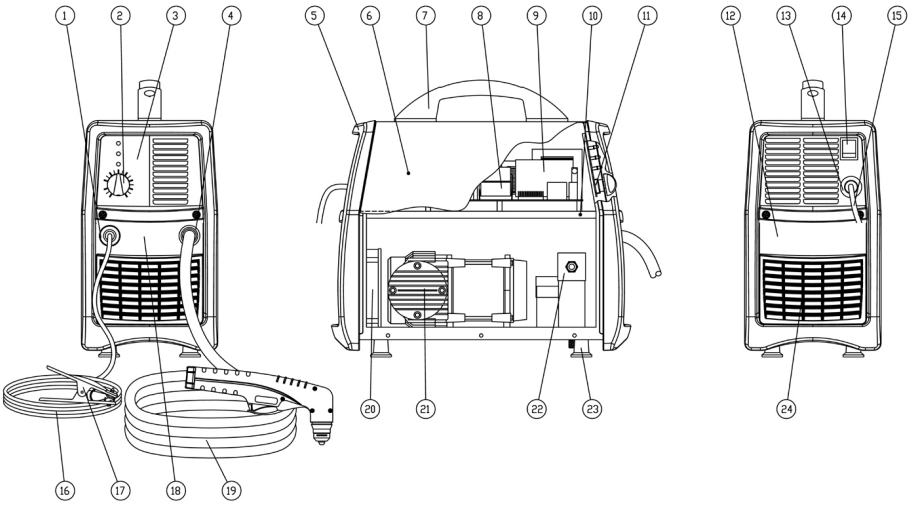
SPECIFICATIONS

Power supply	230V 50Hz 1Ph
Input Current (MAX)	19 A
Output current (MIN-MAX)	12A - 25A
Maximum cutting depth	Steel - 10 mm Alumimium - 10 mm
Protection Class	IP22
Weight	17.9 kg
Dimensions L x W x H	445 x 200 x 400 mm
Part No.	6016020

Duty Cycle	**Current**
40%	25 Amps
100%	12 Amps

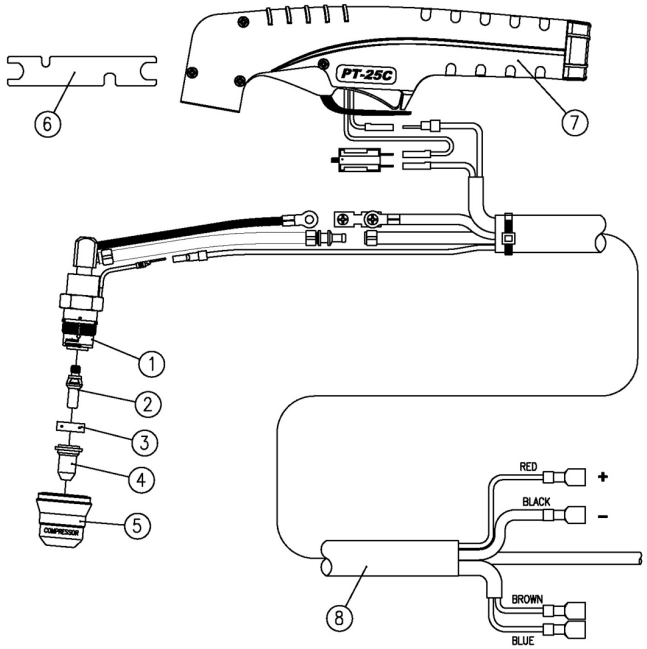
Please note that the details and specifications contained within, are correct at the time of going to print. However, CLARKE International reserve the right to change specifications at any time without prior notice.

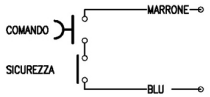
EXPLODED DIAGRAM & PARTS LISTS

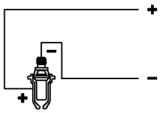


	DESCRIPTION	QTY	PART NO	NO	DESCRIPTION	QTY	PART NO
1	CABLE CLAMP + SCREW	1	EM04600233	13	CABLE CLAMP + SCREW	1	EM04600234
2	POTENTIOMETER KNOB	1	EM21690309	14	DOUBLE POLE SWITCH	1	EM22200043
3	ADHESIVE PLATE	1	EM77650143	15	PVC INPUT CABLE	1	EM20220020
4	RUBBER GROMMET	1	EM21605023	16	EARTH CABLE	1	EM43210150
5	FRAME	2	EM21690505	17	EARTH CLAMP	1	EM22110007
6	COVER PANEL	1	EM33705507	18	FRONT PANEL WITH FRAME	1	EM33710489
7	PLASTIC HANDLE	1	EM21600030	19	PLASMA TORCH PT-25C M4	1	EM23010067
8	PC BOARD	1	EM22735199	20	FAN	1	EM22800021
9	CONTROL PC BOARD	1	EM42735124	21	COMPRESSOR	1	EM22920004
10	DIVIDING PANEL	1	EM33620164	22	AIR FILTER	1	EM22905074
11	PCB FRONT PANEL	1	EM22735201	23	RUBBER FOOT	4	EM21610027
12	REAR PANEL WITH FRAME	1	EM33700282	24	PLASTIC AIR-VENT	2	EM21690506

TORCH EXPLODED DIAGRAM & PARTS LIST

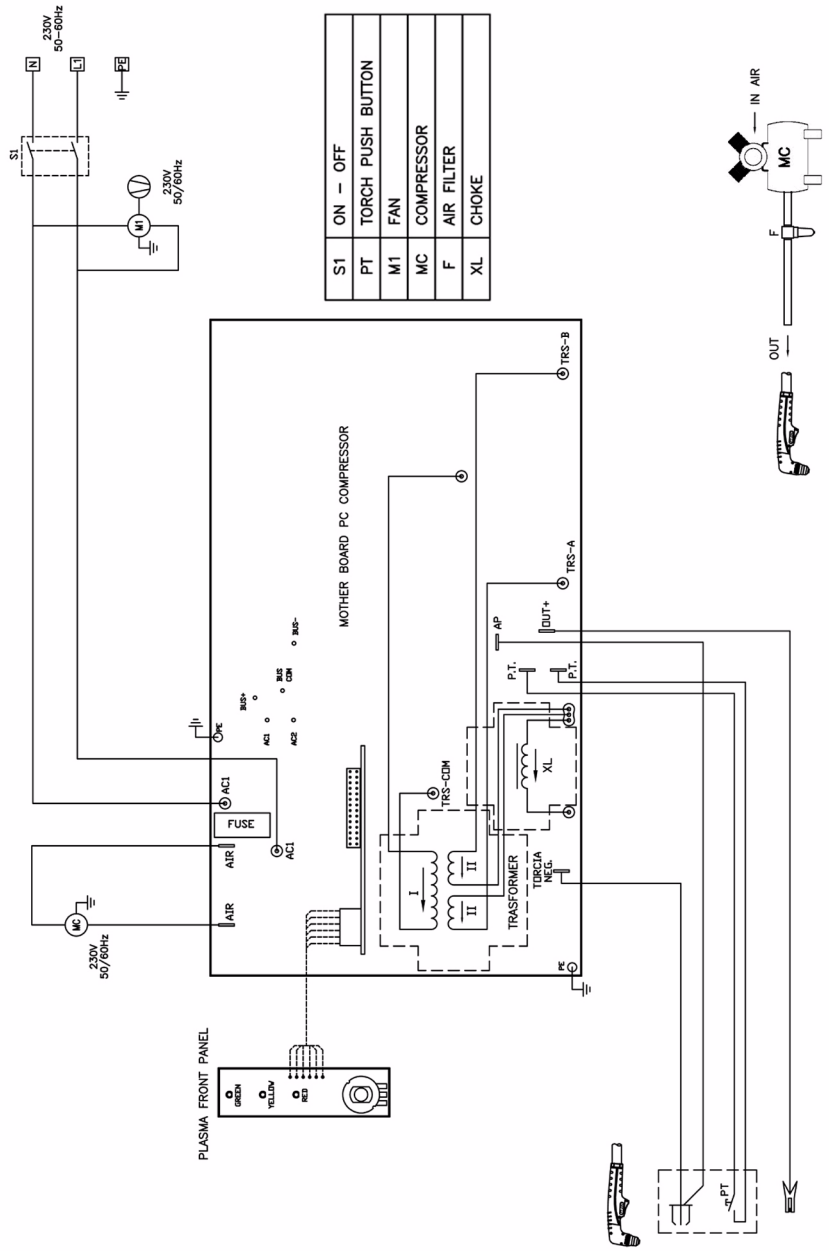






	DESCRIPTION	QTY	PART NO
1	PLASMA TORCH BODY	1	EM23015183
2	ELECTRODE FOR PT-25 C-40-60 52582	1	EM23015187
3	AIR DIFFUSER	1	EM23015179
4	TIP D.0,8 (20-30A)FOR PT-40	1	EM23015186
4	TIP D.0,65 (10-20A)FOR PT-40	1	EM23015189
5	OUTSIDE PROTECTION NOZZLE	1	EM23015182
6	WRENCH FOR ELECTRODE	1	EM23015193
7	HANDLE + MICRO	1	EM23015184
8	CABLE ASSEMBLY FOR TORCH PT-25C 4 MT.	1	EM23015195

WIRING DIAGRAM



DECLARATION OF CONFORMITY

CE

Clarke® INTERNATIONAL

Hemnall Street, Epping, Essex CM16 4LG

DECLARATION OF CONFORMITY

This is an important document and should be retained.

We hereby declare that this product(s) complies with the following directive(s):

89/336/EEC *EMC Electromagnetic Compatibility Directive*

73/23/EC *Low Voltage Equipment directive*

The following standards have been applied to the product(s):

EN 60974-7 *Arc welding equipment. Torches*

EN 60974-10 *Arc welding equipment. Electromagnetic compatibility (EMC) requirements*

EN 60974-1 *Arc welding equipment. Welding power sources*

The technical documentation required to demonstrate that the product(s) meet(s) the requirement(s) of the aforementioned directive(s) has been compiled and is available for inspection by the relevant enforcement authorities.

The CE mark was first applied in: 2008

Product Description:	Plasma Cutter	
Model number(s):	Plasma King 30SI,	Plasma King 20CI,
Serial / batch Number:	6016010	6016020
Date of Issue:	20/11/2008	

Signed:

J.A. Clarke

Managing Director

NOTES

NOTES

A SELECTION FROM THE VAST RANGE OF

Clarke®

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From DIY to industrial, Plus air tools, spray guns and accesories.

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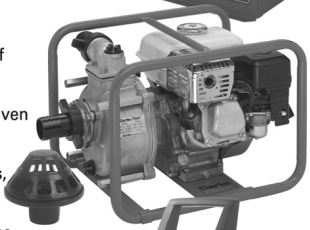

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